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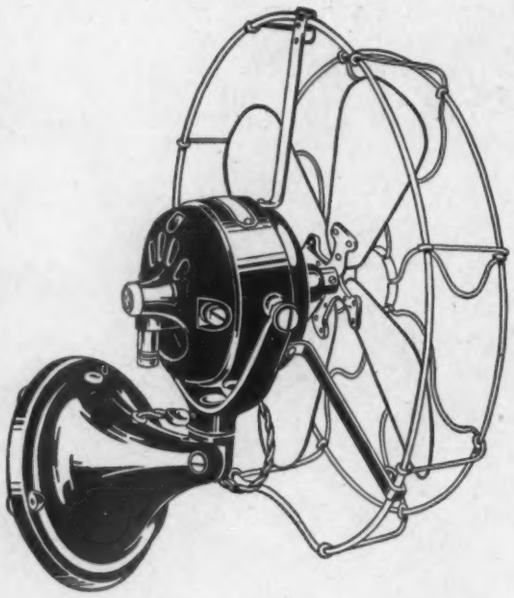

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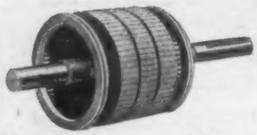

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A UNIQUE CENTRAL HEATING PLANT

BY OTTO B. GOLDMAN.

The Portland Central Heating Company's plant in one of the aristocratic residence districts of Portland, Oregon, is unique in that it is confined to residence heating exclusively. The idea of community heating has grown slowly, while such service as transportation, lighting, etc., has been handled through public service corporations or municipalities for a number of years.

The elimination of furnaces and heating stoves appeals to any family, when hot water is also furnished 24 hours a day from an outside source, such as in this system. A system of this kind also cuts down the cost of keeping the tinting, carpets and furniture free from deterioration caused by the soot and dirt always present with stoves and furnaces. The labor in connection with private systems is abolished. The added convenience is one of the final convincing arguments in its favor.

Portland Central Heating Plant, Showing District Service.

The Portland central heating plant was first started by a few of the progressive and well to do residents of Westover Terrace. It was intended to put in a small central plant with boilers of about 10,000 sq. ft. of heating surface, and 3 in. mains. In a short time there proved to be such a demand for heat, however, that the size of equipment had to be successively raised, until finally boilers of 30,000 sq. ft. of heating capacity and 8 in. mains were installed. This only satisfies the present demand.

This equipment has been in operation over three years and the service covers 17 city blocks. In order to provide for future demands, the company is now doubling its present capacity.

In operating, water is taken from the boilers at about 180 degrees F. and forced through the mains, which branch off into the buildings served. The water then passes through the radiators in residences and thence back again through the return pipes to the central plant, where the water is again raised to the original temperature. The reduction in temperature of the water due to the circulation through the system is usually about 8 to 20 degrees.

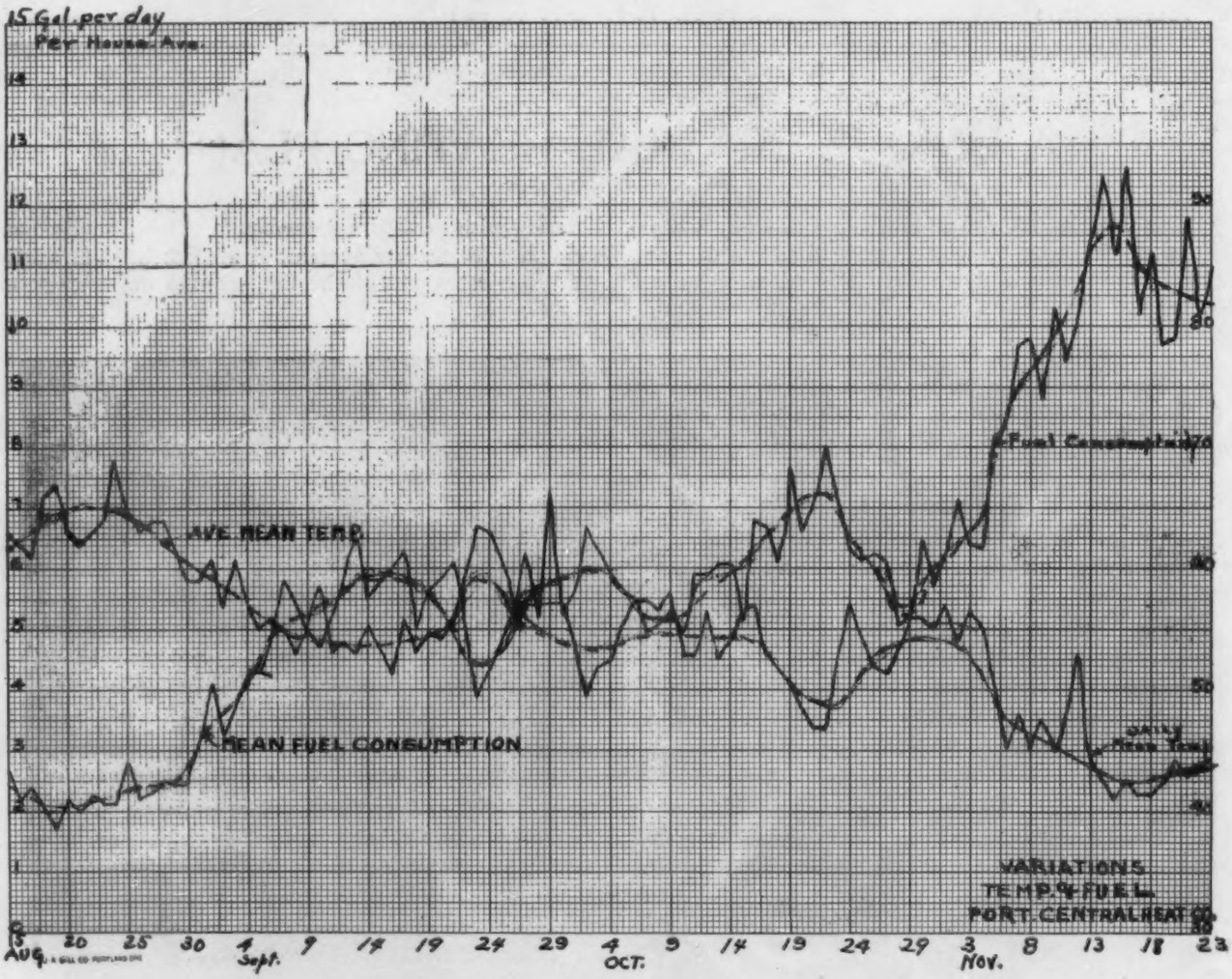
The pipes carrying the hot water are laid in concrete conduit, coated with asbestos for heat insulation, and finally coated with Ajax waterproof paper cemented on with asphaltum. The loss of heat has been found to be reasonably small, amounting to less than 1¼ degrees F. per 1000 ft. of pipe.

On account of the district being hilly difficulty was at first experienced in regulating the amount of water passing each radiator. It is evident that if one radiator passed too much water, it was done at the expense of some other radiator, and uniform heating could not be maintained throughout the system. This was finally overcome by the placing at each radiator an auxiliary valve and adjusting this until a uniform pressure drop of two pounds was obtained across each radiator, thus insuring a uniform flow.

The plant as now installed consists of two No. 47 Hawkes combination tube and tubular type boilers, having 30,000 sq. ft. of heating surface each. These are equipped with crude oil burners so that the attendance is small, only one man being employed on a shift, there being a day and night shift.

Considerable difficulty was at first experienced in obtaining a satisfactory circulating pump for the system. When some of the radiators were shut off, the pump pressure increased, the circulation in the remaining ones would increase, causing a considerable rise in temperature. This difficulty was overcome by installing a 3 in. Goldman constant pressure water type centrifugal pump, made by the Portland Pump Company, Portland, Oregon, which is successfully doing the work.

The following method is employed in figuring radiation and in getting a basis for establishing the price charged customers for thus heating service. Divide the cubic contents of the residence by 200, add to this the number of sq. ft. of glass in the residence and divide by 2, and then add to the above the number of sq. ft. of exposed wall divided by 10. The sum of



Average Daily Fuel Consumption per Hour Service.

these three quantities is taken as the square feet of radiation of the residence and is then multiplied by 30 cents per sq. ft. of radiation which gives the cost per year for the service.

The accompanying curve shows the average daily fuel consumption per house served, together with the daily mean temperature extending over a period from the middle of August to the last of November. The curves do not fully show the conditions; for example, a wet day will require more heat than a comparatively dry day of equal temperature, also a day of extreme temperature requires more fuel than one remaining throughout close to the mean temperature. However, the dotted curve of average mean temperature and that of mean fuel consumption are valuable in helping a person to anticipate the fuel consumption under varying conditions.

RULES FOR GROUNDING ELECTRICAL EQUIPMENT.

As proper grounding is one of the most important guiding principles of the forthcoming National Electrical Safety Code, the following rules for grounding circuits, equipment and lightning arresters for stations, lines and utilization equipment should be carefully studied by everyone interested in "safty first" with regard to electric construction. These methods give permanent and effective grounding that complies with the code requirements:

Where Ground Wire Shall Be Attached.

(a) Direct Current 3-wire Systems: The neutral wire in direct current 3-wire systems shall be grounded at the station.

(b) Alternating Current Secondary Systems: The neutral wire of a 3-wire (not 3-phase) secondary, or one side of a 2-wire secondary, of power or instrument transformers, shall be grounded at the transformer, at the service to a building, or (if serving more than one building) at the individual service to each building.

Where transformers feed systems extending over 500 feet, the grounded neutral or the grounded side of the secondary circuit shall be grounded at least every 500 ft.

(c) Equipment: The point at which the ground wire connection is made to the equipment shall be accessible.

(d) Lightning Arresters: The ground wire shall lead from the ground terminal of the arrester to the ground connection in as direct a line as possible, avoiding sharp bends.

Grounding Wire.

(a) Material and Continuity: The ground wire should be of copper, and be continuous and without joints, if practicable.

Approved metal conduit, when necessarily used in place of any portion of the ground wire for equipment or circuits, or for grounding other portions of a conduit system, shall have all joints so made and maintained as to withstand the same resistance and current carrying capacity tests as are required for the ground wire itself by rule 4.

No automatic cutout shall be inserted in the ground connection; no switch shall be so inserted except in plain sight and effectively isolated from uninstructed persons.

(b) Size: For grounding circuits, the cross-sectional area of the ground wire (if copper) shall be not less than one-fourth that of the largest conductor or the total of all conductors utilizing it, and in no case less than No. 6. If other material than copper is necessarily used, the same conductivity shall be secured.

For electrical equipment, the current carrying capacity of the ground wire shall not be less than those of the wire sizes given in the following table opposite the ratings of the nearest automatic cutouts through which the grounded equipment is connected to the source of energy supply.

Required Size Ground Wire. A. W. G.	Capacity of Automatic Cutouts Amperes
18 (Permitted only	10
10 in portable cord	10-100
6 to portable equip-	100-200
0 ment)	200-500

(c) Mechanical Protection: Where exposed to mechanical injury, the ground wire shall be protected by substantial conduit or other guard which if of metal shall be permanently and effectively grounded, and if for lightning arresters shall be non-magnetic. On poles or against buildings accessible to other than properly qualified electrical workmen, this protection shall extend from a point below the surface of the ground or platform to a point at least 10 ft. above. On side walls inside buildings, unless isolated from all traffic, this protection shall extend from a point below the surface of the ground or platform to a point at least 7 ft. above.

(d) Underground: Ground wires laid underground shall unless othewise mechanically protected, be laid slack to prevent their being readily broken. Joints in underground connections should be avoided (especially between dissimilar metals) and where necessarily used shall be protected against corrosion by thoroughly covering them when dry with waterproof coating and mechanically protecting this coating.

Ground Connections.

The ground connection shall be permanent and effective, and include:

(a) Piping Systems: For circuits, equipment and arresters at supply stations, all available underground continuous metallic piping systems, and at other places to at least one such system.

Available in this rule means ordinarily within 500 ft. for stations or lines and at least 100 ft. for utilization equipment.

(b Frames of Buildings: Where underground metallic piping systems are not available, other approved methods which will secure requisite permanence and conductivity may be permitted; as per example, in some cases the steel of a building.

(c) Artificial Grounds: When resort must be had to artificial grounds, their number should be determined by the following requirements:

1. Three separate grounds should usually be made, unless a smaller number give less resistance than specified in rule 4.

2. If, however, no part of the circuit or equipment protected can be reached by persons standing on ground or damp floors, or by persons touching also any metallic piping to which ground wire is not effectively connected, a single artificial ground, even if resistance exceeds that specified in rule 4.

3. Arrester grounds may usually be single, if the arrester is of small capacity.

(d) Method: Ground connections to metallic piping systems should be made outside of main cocks, meters, or other devices which interrupt the continuity of the underground metallic pipe systems, but may be made immediately inside building walls to secure accessibility for inspection and test. If meters, main cocks, or other devices are located outside buildings, they shall be suitably shunted, if the ground connection is made inside the building.

The ground connection to underground metallic piping systems should be made by sweating the ground wire into a lug attached to an approved clamp and firmly bolting the clamp to the pipe after all rust and scale have been removed, or by soldering the ground wire into a brass plug

and screwing the plug tightly into the pipe fittings, or where the pipes are cast iron, into a hole tapped into the pipe itself; or connection may be made by other equivalent means. The point of connection should be as readily accessible as possible, and the position recorded.

With bell and spigot joint pipe it may be necessary to connect to several lengths where circuits of large current carrying capacity are being grounded.

Artificial grounds should be spaced not less than 6 ft. apart, and be located below permanent moisture level or at least 10 ft. deep, where possible, each presenting at least 2 sq. ft. surface to exterior soil. Areas where ground water level is close to the surface should be used when available.

Ground Resistance.

(a) Limits: The total resistance of the ground wires and connections of any grounded circuit or equipment should not exceed the values given below:

Ohms.	Amperes.
5.0	10
2.0	25
1.0	50
0.5	100
0.25	200
0.1	500

Note: The product of the corresponding number in the the two columns always equals 50.

In exceptionally dry soils it may be impossible to obtain as low resistances as specified above, even with 3 grounds in parallel as specified in rule 3 (c).

(b) Checking: The resistance of any ground wire and its ground connection should be periodically checked by measuring the voltage between the ground wire of the circuit, the frame of the equipment or the grounded point of the lightning arrester, and any exposed metallic piping in neighboring buildings or vicinity, and if possible while the rated current, according to the above table, is flowing through the ground wire and connections.

Joint Use of Grounds and Ground Wires for Different Systems.

(a Ground Wires: Ground wires for circuit equipments shall not be utilized also for grounding lightning arresters.

Ground wires used for low voltage lighting or power circuits shall not be used also for grounding frames of equipment or wire runways operating on d.c. railway circuits, or at voltages over 750.

Ground wires should be run separately to the ground itself from equipment and circuits of the following general classes:

Lightning arresters,

Secondaries of low voltage lighting or power circuits,

Secondaries of instrument transformers and instrument cases,

Secondary relay circuits where protective relays are operated from separate series transformers,

Frames of d.c. railway equipment or equipment over 750 volts.

(b) Grounds: Lightning arresters shall not be grounded to the same artificial ground (pipes or plates) as circuits or equipments, but should be spaced as widely as practicable from other artificial grounds.

Lightning arrester grounds should not be made to water piping systems within buildings, if circuits or equipments are grounded to such systems.

Where practicable, separate grounds should be provided for ground wires from equipment and circuits of the following general classes, particularly if artificial grounds are necessarily used:

Lightning arresters,

Secondaries of low voltage lighting or power circuits,

Low voltage instrument transformer secondaries,

Frames of d.c. railway equipment or equipment over 750 volts.

THE USE OF ELECTRIC POWER IN PUMPING WATER FOR IRRIGATION.

BY H. DAY HANFORD.

(After a brief discussion of the advantages of the induction motor the author gives figures on the cost of pumping with centrifugal and triplex pumps. This paper is abstracted from the Proceedings of the Washington Irrigation Institute, North Yakima, meeting, Dec. 16-18, 1914.—The Editor.)

The use of electric power to operate pumps furnishing water for irrigation purposes dates back but a very few years, and it is only within the past ten years that it has come into extensive use in the Northwest. This use has been made possible by the development of water power furnishing electric current at lower cost than when generated by steam, and further by the extension of transmission lines into sections where the power can be utilized. The use for pumping purposes has also been greatly advanced by the development of the induction motor and centrifugal type of pump.

In the induction motor, the user of electric power has a prime mover that combines to an extraordinary degree the vital essentials of high efficiency, reliability, low cost and safety. When we add to the above good points the secondary, but important advantage of small amount of attention required, it must be acknowledged as standing first in the list of desirable forms of power for operation of pumps wherever power is available at suitable rates.

The induction motor is especially well adapted for direct connection to centrifugal pumps, which require steady rotative speed and uniform torque. The range of speed in the various sizes of motors gives great flexibility in the design of pumps, and is a factor in making possible the production of centrifugal pumps at much lower cost than reciprocating pumps of the same capacity. While direct connection to centrifugal pumps requiring high rotative speed is the especial field of the electrical motor, it loses none of its advantages when used for driving any of the various types of power pumps.

In the centrifugal pump we have a type that has all the desirable essentials enumerated for the induction motor, except efficiency; and while the efficiency frequently falls below 30 per cent in small sizes, and seldom exceeds 50 per cent in the class of pumps offered for irrigation work for capacities of less than 500 gallons a minute, the disadvantage of low efficiency may be more than offset under some conditions of service by the lower first cost and convenience of operation. In larger sizes, the efficiency is improved, but seldom exceeds 70 per cent. Taken as a whole, the combination of induction motor direct coupled to a centrifugal pump will give a unit that is hard to improve upon for economical service. If properly selected and installed, and given reasonable attention, it will render reliable service, and can be successfully operated by any one of average intelligence. It is about as nearly "fool proof" as a pumping unit can be made.

The electric motor can be used to drive any of the various forms of power pumps, either by direct connection or by means of a belt. The belt drive is, in general, the most satisfactory, especially if a high speed motor is to be used. Even with the belt drive

it is desirable to use either slow or medium speed motors. Of the power pumps the triplex type with outside packed plungers seems to give the best service. The first cost of this type of pump is much higher than the centrifugal, and it shows up to disadvantage at low heads and large volumes; while at high heads, the mechanical efficiency is higher than the centrifugal but increased first cost limits the field where it can be used to advantage.

I have been asked to give some figures on cost of pumping plants, and cost of operation. As a basis for the figures, the representative of a well-known manufacturer was asked to give prices, efficiency and other data on both centrifugal and triplex power pumps, ranging in capacity by the hundred gallons, from 100 to 500, inclusive, a minute, and for heads of 25, 50, 100 and 200 feet. Taking these prices as a basis, and adding the cost of motor, fittings, erection and building, we have the following schedule of plant costs:

Direct Connected Centrifugal Pumps.

Capacity G. P. M.	Head.	Size.	Cost of Plant.
100	25	2½-in.	$ 407.00
100	50	2-in.	369.00
100	100	2-in.	479.00
100	200	2-in. 2 S.	715.00
200	25	3-in.	550.00
200	50	3-in.	550.00
200	100	2½-in.	600.00
200	200	2½-in. 2 S	875.00
300	25	4-in.	644.00
300	50	3-in.	644.00
300	100	3-in.	715.00
300	200	3-in. 2 S	1,034.00
400	25	5-in.	732.00
400	50	4-in.	698.00
400	100	3-in.	748.00
400	200	4-in. 2 S	1,249.00
500	25	5-in.	787.00
500	50	4-in.	765.00
500	100	4-in.	831.00
500	200	5-in. 2 S	1,524.00

Belt Driven Triplex Pumps.

Capacity G. P. M.	Head.	Size.	Cost of Plant.
100	50	5½x8-in	$7 741.00
100	100	5½x8-in	764.00
100	200	5½x8-in.	821.00
200	50	7½x8-in.	1,216.00
200	100	7½x8-in.	1,261.00
200	200	7½x8-in.	1,319.00
300	50	8½x10-in.	1,437.00
300	100	8½x10-in.	1,517.00
300	200	8½x10-in.	1,600.00
400	50	10x10-in.	1,877.00
400	100	10x10-in.	1,979.00
400	200	10x10-in.	2,065.00
500	50	10x12-in.	2,463.00
500	100	10x12-in.	2,510.00
500	200	10x12-in.	2,792.00

In comparing the schedule, you will note that in a number of instances the cost of plant for a given head is less than that of the preceding lower head, and that smaller sizes are used,—these are not errors. In centrifugal pumps, the capacity within a certain range is governed by the design of the impeller and the speed, and not by the diameter of the discharge nozzle. Also in the triplex pumps, exactly the same pump is offered for more than one head. The total plant costs are also affected by the cost of motor used, which varies according to the speed, the slow speed motors costing considerably more than those of high speed. The sizes and types of pumps and motor speeds are those selected by a man of large experience in irrigation work; and while better selections might be made in some cases, the list represents probable average practice, and as used here, is a fair basis.

In arriving at a basis of operating costs for each year, the following assumptions were made:

(1) That the irrigation season covers the period from May 1st to September 30th, inclusive;

(2) That the pumps would operate 24 hours a day for 26 days each month, or a total of 130 days;

(3) That the pumps would operate 624 hours each month;

(4) That the capacity of the several sizes of pumps operating on the above schedule would be as follows for the season:

Size.
100 gallons per minute = 57.5 acre feet.
200 gallons per minute = 115.0 acre feet.
300 gallons per minute = 172.0 acre feet.
400 gallons per minute = 230.0 acre feet.
500 gallons per minute = 287.5 acre feet.

(5) That power would be paid for on the meter basis, and on the schedule in use in the Yakima Valley;

(6) That interest on investment in plant be figured at 7 per cent;

(7) That depreciation and renewals be figured at 7 per cent;

(8) That cost of supplies be taken at 1 per cent of cost of plant;

(9) That insurance be figured at 1 per cent.

Making a total for the last four items of 16 per cent.

In determining final costs for any particular location, it will be necessary to add the charges upon whatever pipe line is required to deliver the water to the desired point, also the yearly cost of water right, if water is purchased from a ditch.

Cost of Pumping for Season.

Direct Connected Centrifugal Pumps.

Capacity in Gallons per Min.	Head in Feet.	Cost per Acre Foot Pumped.
100	25	$2.24
100	50	3.00
100	100	4.93
100	200	8.17
200	25	1.68
200	50	2.24
200	100	3.68
200	200	6.59
300	25	1.37
300	50	1.93
300	100	3.16
300	200	5.57
400	25	1.25
400	50	1.74
400	100	2.90
400	200	4.99
500	25	1.11
500	50	1.59
500	100	2.65
500	200	4.82

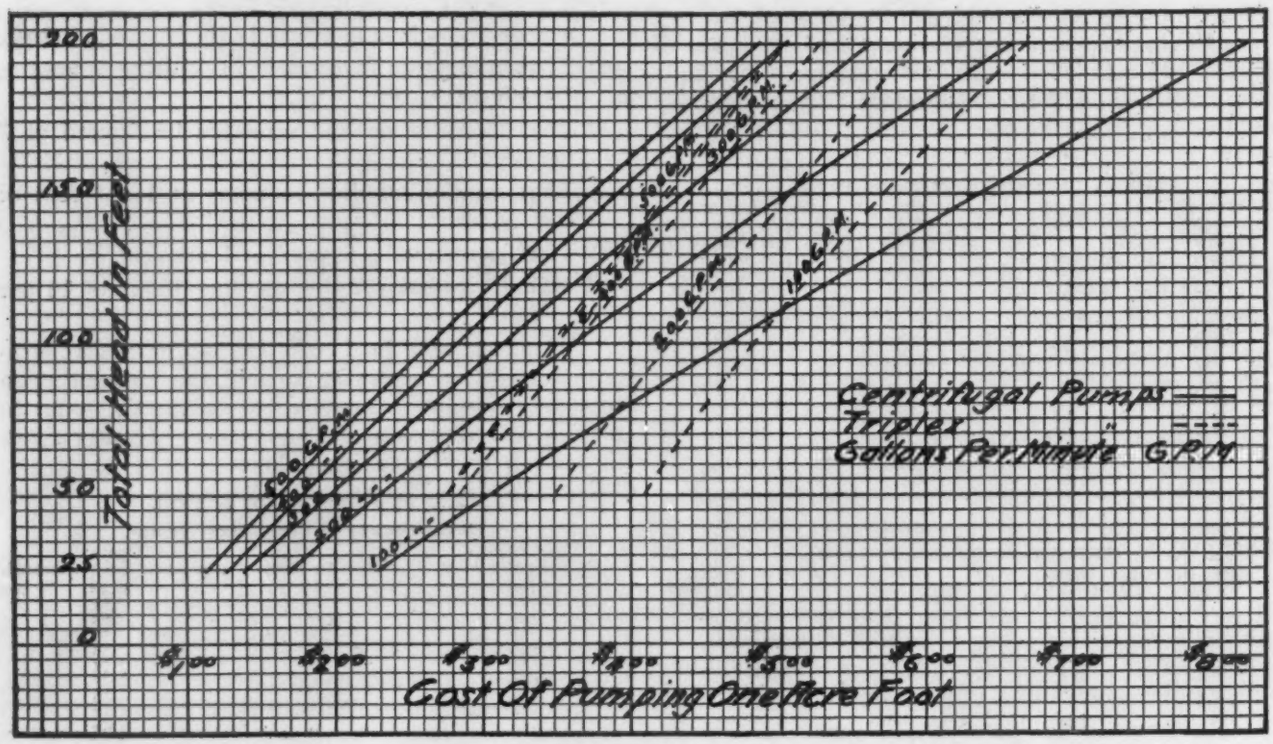
Belt-Driven Triplex Pumps.

Capacity in Gallons per Min.	Head in Feet.	Cost per Acre Foot Pumped.
100	50	$4.08
100	100	4.80
100	200	6.65
200	50	3.47
200	100	4.25
200	200	5.89
300	50	2.83
300	100	3.64
300	200	5.23
400	50	2.76
400	100	3.54
400	200	5.02
500	50	2.77
500	100	3.46
500	200	5.00

By platting these figures on paper, we have a diagram from which it is possible to ascertain the approximate cost per acre foot for pumping to any head between 25 feet and 200 feet for the centrifugal pumps of the respective capacities, and for heads between 50 feet and 200 feet for the triplex pumps. On the accompanying diagram, the centrifugal pumps are represented by full lines, and the triplex pumps by dotted

lines. The point at which the full and dotted lines of the same capacity cross, indicates the approximate head at which the types will operate with equal economy. This is 110 feet for the pumps of 100 G. P. M. capacity, 150 feet for the 200 G. P. M., and 165 for the 300 G. P. M. Above these heads, the diagram indicates that the triplex pumps will be the more economical. It also shows that for the 400 G. P. M. capacity the types balance at 200 feet head; and that for the 500 G. P. M., the centrifugal is the more economical pump within the range of head considered.

The figures and digram clearly show the lower cost per acre foot as the size and capacity are increased. This leads to the suggestion that where conditions are favorable for serving two or more tracts from one point, that it will be economy for the owners to join in building one plant that will give the best results, rather than to construct two or more plants of lower efficiency and higher cost and maintenance.



Cost of Pumping.

While no general rule can be laid down as to the maximum height to which water for irrigation purposes can be pumped with economy, it is possible to analyze each individual problem. It is simply a question of balancing the fixed interest and operating charges of the pumping proposition on one side, as against the probable yearly net return from the land to the owner when under water. Or against the interest and maintenance charges on an equally desirable piece of land with an equivalent water right under a gravity project. As an illustration, let us assume two tracts of land of similar soil and desirability; one with a water right of 2½ acre feet that can be purchased for $200.00 an acre, the water tax being $2.00 an acre.

With interest at 7 per cent, the annual charges for an acre are as follows:

Interest on $200.00 at 7 per cent	$14.00
Water tax, or ditch maintenance	2.00
Total yearly fixed charges	$16.00

If for the pumping proposition we assume that an equally desirable piece of land above the same ditch is available at a cost of $125.00 an acre, including the water right, then the annual fixed charges for an acre are as follows:

Interest on $125.00 at 7 per cent	$8.75
Water tax, or ditch maintenance	2.00
Total yearly fixed charges	$10.75

Comparison.

Yearly fixed charges per acre, gravity supply	$16.00
Yearly fixed charges per acre, pumping project	10.75
Difference available to cover cost of pumping	$ 5.25

This $5.25 is available for pumping 2.5 acre feet, or at the rate of $2.00 an acre foot. By reference to the diagram, we find that the limit of height for a cost of $2.10 an acre foot is approximately as follows for the several pump capacities considered:

Capacity in gal. per min.	100	200	300	400	500
Total head	20	45	55	65	75

The figures given above will apply for plants along the Sunnyside canal, assuming the cost of the land without a water right as $73.00 an acre, the cost of the water as $52.00 an acre, and the yearly water tax 95 cents an acre. The comparison being as follows:

Gravity Project.

Interest on $200.00 at 7 per cent	$14.00
Water tax	.95
Total yearly fixed charges per acre	$14.95

Pumping Project.

Interest on cost of land, $73.00 at 7 per cent	$5.11
Interest on cost of water right, $52.00 at 7 per cent	3.64
Water tax	95
	$9.70

Comparison.

Yearly fixed charges, gravity supply	$14.95
Yearly fixed charges, pumping project	9.70
Available for pumping 2½ acre feet	$ 5.25
Available for pumping 1 acre foot	2.10

The figures relating to cost of land and water rights are simply assumed to illustrate the method of weighing the charges.

The item,—cost of maintenance, has not been included in any of the preceding figures, for the reason that it is subject to wide variation. Under some conditions it may be very important. The yearly cost for attendance must be determined for each installation, and measured by the standard of value of the time of the attendant. The successful rancher is the one who makes the best use of his time in the fields and orchard during the irrigation season. On the small place, where the rancher looks after the plant in person, the cost of attendance measured in the value of his time may be very high. On the large place, or in the case of a plant serving several tracts and cared for by a farm hand, the cost will be greatly reduced. If properly installed, the small plant will probably require not less than one-half hour of the time of the attendant each day; and the plant of 500 gallons a minute capacity, one hour's time each day. Whether cared for by the rancher or by the farm hand, it is important that the plant be installed to give reliable, efficient service, as during the time of its use the rancher should be an irrigator and not a pump nurse. There is one point, however, that is very clear, namely: that of all forms of power available for pumping, the electric motor driven unit will require the least attention.

From what has preceded, it will be apparent that the questions, whether a tract can be economically irrigated by pumping, and the limit of pumping head, can only be decided by first determining the total charges for an acre, consisting of interest on investment in land and water right, water tax and cost of pumping including labor. By following the methods outlined, and using the figures and diagram relating to costs, the prospective irrigator can determine the approximate charges for installations within the given range of capacity and head.

This paper is not intended as the last word from an engineering point of view, but rather as a possible aid to the irrigator who has a pumping problem under consideration. If it is of assistance in the successful solution of a single pumping installation, it will have served its purpose.

The effect of boron in small quantities is to improve the magnetic properties of pure iron melted in vacuo because it reduces the iron oxide. But if enough is added to leave a measurable quantity combined with the iron it has a detrimental effect.

The luminous efficiency of light sources based on 50 c.p. per watt as the mechanical equivalent of light, has been determined by Herbert E. Ives to be as follows:

Light Source.	Luminous Efficiency of the Radiation, per cent.	Total Luminous Efficiency, per cent.
4 watt carbon lamp.....	0.45	0.42
Vacuum tungsten lamp at 1.25 watts per candle	1.65	1.3
Nitrogen-filled lamp at 0.70 watt per candle	2.93	2.4
Welsbach mantle, 0.75 per cent "Ceria"	1.2	0.19
Open-flame gas burner	0.19	0.036
Yellow flame	....	7.2

LETTER TO THE EDITOR.

Limitations of Off-Peak Power.

Sir:—I was much interested in an article in your issue of March 27, 1915, setting forth the attractiveness of the Pacific Coast for the establishment of electro-chemical industries which might utilize the off-peak load which now aggregates a waste if computed in dollars and cents amounting to an enormous total.

There is no question of the benefit to the whole country to be derived from the utilization of the off-peak power and there will undoubtedly come a day when this great waste will be turned into profit.

There are enthusiasts, however, who would do well to analyze clearly the situation of off-peak load so that they will not be led into building on possibilities which cannot materialize. It is obvious that the price at which power is now sold is such that it includes the cost of the off-peak load. In other words the power used has to carry the cost of unused power and a consequent result of using off-peak power would be that this off-peak power would carry its own cost, thus relieving power now sold of this burden, resulting in a readjustment of rates to the benefit of present users and the utilizing of power not used, to the general welfare of the community.

It should be borne in mind that power will not be sold for less than the cost of production and the capital expenditure per h.p. will regulate the minimum at which power can be sold. That is if the capital cost per h.p. ranges from $150 to $300 it then follows if 10 per cent is allowed for depreciation and interest the fixed charges alone would amount to from $15 to $30 per h.p. a year.

Power is sold at Niagara to the chemical industries for $15 a year, from which it is evident at this time that either the efficiency of the electrical processes must be increased or that chemical industries must look for power from developments with an extremely low capital cost. In working up chemical industries for the utilization of "the tremendous off-peak power for which no profitable use has been developed" it must be borne in mind to allow for this power a value at least as great as the cost of production.

Our large hydroelectric developments are regulated in the way of rates by the Railroad Commission, which allows them a fair return on their money. By the advent of the utilization of off-peak power the general public would be benefited, but the net returns of the power companies would not be increased.

Lack of off-peak power does not necessarily imply any waste of power, for during this period the water can be conserved if the storage is adequate. However, to provide for the peaks means a great extra outlay of capital and in this sense the off-peak load is a waste of power.

A power that can be developed for a capital expenditure of $35 per h.p. at a favorable site, offers to the electro-chemical industries continuous power at a price that can not be attained by the purchase of off-peak power, necessarily not continuous, from any of the existing hydroelectric developments in California.

E. P. KENNEDY.

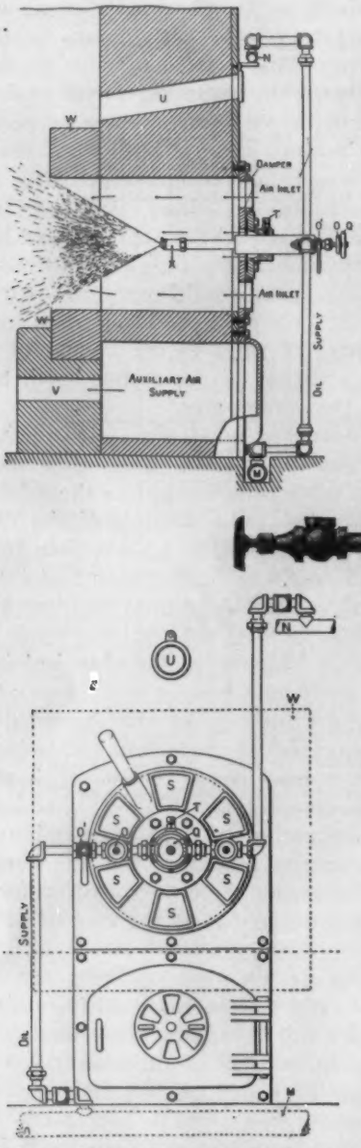
San Francisco, April 30, 1915.

INDUSTRIAL USES OF FUEL OIL

BY F. B. DUNN.

Fuel Oil for Naval and Maritime Purposes.

The supply of a fuel is one of the most important problems with which the navies and steamship companies of the world have had to deal. That fuel oil has practically solved this problem is clearly indicated by the number of vessels at present in use in which oil is the principal or only fuel.



Fif. 86. Front View and Sectional Elevation of Spray Burner.

A method of using oil at sea was successfully worked out over 40 years ago by the marine engineers on the Caspian Sea. The process used was most carefully kept secret as the shipowners considered it a most valuable asset. Thus when large quantities of oil were discovered in Texas and California, it remained for the engineers in those localities to work out the problem for themselves. The success they achieved is indicated by the economies effected, the high evaporative results obtained and the reports showing an engine horsepower produced on one pound of oil or less. Exhaustive tests were conducted some years ago by the naval engineers, in order to determine the most practical method of using fuel oil, and of storing oil in vessels. As a result of these tests, which were carried out by the U. S. Naval "Liquid Fuel" Board, under the direction of Rear Admiral George W. Melville, some of the newest battleships

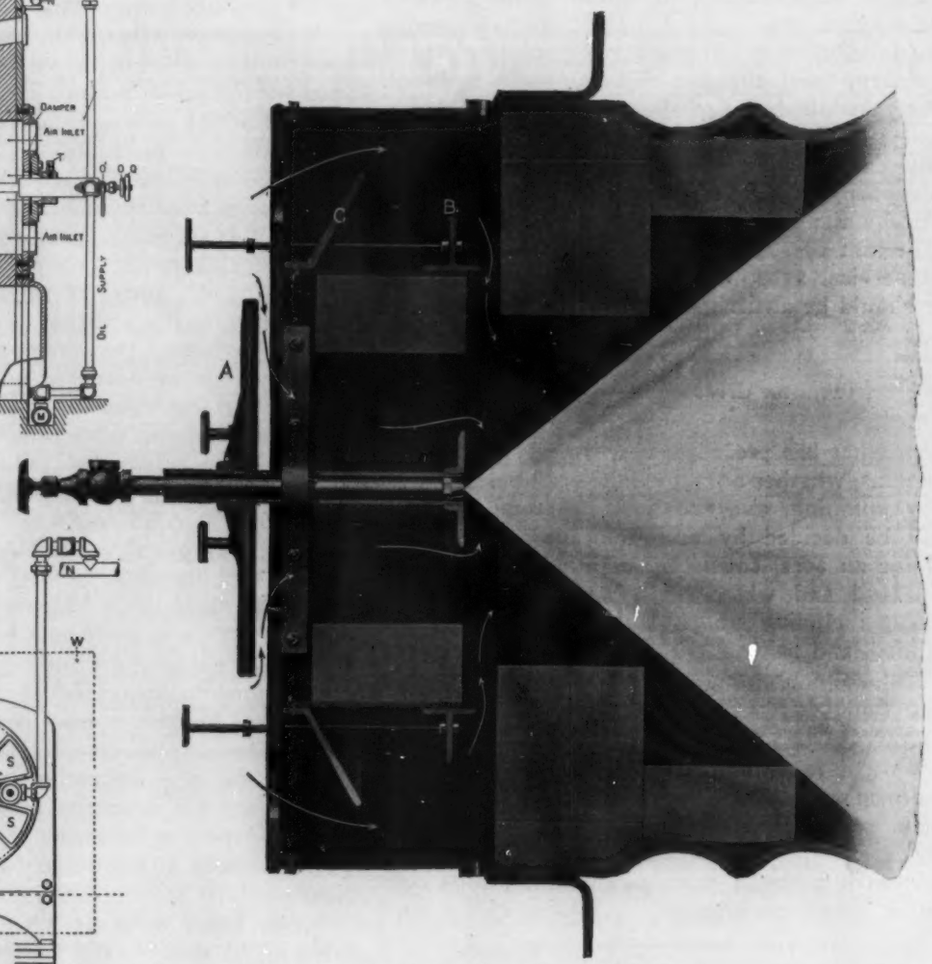


Fig. 87. Coen Mechanical System.

have been equipped to use fuel oil exclusively, while others are so arranged that both coal and oil may be burned at the same time, or either fuel can be burnt separately.

It is interesting to note, in connection with these naval tests, that any person interested in the use of oil as a fuel, or anyone having an oil burner to try out, was welcome to be present during the tests. In marked contrast were the tests made by the British Admiralty; when the cruisers Bedford and Arrogant were being changed for fuel oil at Devonport in 1903, the workmen were drafted from the naval station at Portsmouth to conduct the trials, and the authorities guarded the results so jealously that it was impossible for anyone outside to gain information. Even now

no naval officer is allowed to prepare data or lecture on this subject without special permission from the Admiralty.

The American Hawaiian Steamship Company was one of the first commercial companies to investigate fuel oil for maritime use. The steamers Nebraskan and Nevadan were the first to be equipped with oil burning apparatus. The writer made many trips on the Nevadan during the time the tests were being conducted, and great credit should be given to Messrs. Lassoe and Lovekin for the invention of their oil burner. In order to determine the most economical method of burning fuel oil, many changes were made in the construction of the burners, both steam and air being tried as atomizing agents. The results finally obtained were most gratifying, and even up to the present time, the writer has yet to see a more economical oil burning equipment in which oil or steam is used for atomizing.

When one realizes, however, that it requires at least one lb. of water to atomize 3 lb. of oil, and that an average voyage will require 1,000 barrels of oil at 330 lb. per barrel, or 330,000 lb. of oil, which requires 110,000 lb. or 13,200 gallons of water for atomizing, it is evident that large water tanks must be used to carry this water, or evaporators installed to make up the supply, unless some other means of atomizing is used.

Some steamers have been fitted with air compressors, both of the low and high pressure type. These gave very satisfactory results, but were costly to install and operate. Probably, the most satisfactory method that has been invented is the mechanical system of atomizing. This was first brought to the writer's attention in 1907, when an installation known as the "Meyers Liquid Fuel Burner," was invented on the S. S. Romany, an oil tanker of 1600 i.h.p. The results of the first test show that an i.h.p. was developed by 1.21 lb. of oil. Prof. E. H. Peabody stated, in a paper read before the Society of Naval Architects and Marine Engineers in New York, Nov. 22, 1912, that "the mechanical atomizer," so called. is understood to mean a device which sprays or atomizes oil or other liquids by pressure alone, without the use of compressed air, steam or other exterior atomizing agents. He also calls attention to the fact that no mechanical atomizer produces a revolving spray, but states that the particles of oil fly off in straight lines under the influence of centtrifugal force, thus forming a hollow conical spray.

A number of burners operating on this system are illustrated herewith. Fig. 92 shows a front and sectional elevation of the Spray Engineering Company's oil burner installation as applied to the average boiler. Fig. 93 shows the Coen Mechanical system, in which air is pre-heated by passing under the bottom of the furnace. In the design of the furnace, Mr. Coen paid particular attention to the following important features: first, the uniform distribution of heat in the fire-box; second, uniform admission of air for combustion; third, control of the direction and volume of this air; and fourth, the avoidance of heat losses due to radiation from the furnace to the fire-room. By referring to the figure, one can readily see how well these points have been covered. The distribution of the heat is absolutely uniform and the diameter and length of the flame from the burner is under perfect control. Two different and distinct supplies of air are provided for, each individually controlled; primary air is admitted at A, and auxiliary air at B. The flexibility of this arrangement permits a combination of different air currents in varying proportions, which take care of any draught conditions experienced by a steamer at sea. The radiation baffle C prevents the heat of the furnace from entering the fire room.

The following report shows the efficient results obtained with this system.

STEAM ATOMIZING VS. MECHANICAL. ....

A Comparative Record of Two Steam Schooners, Operating Under Identical Conditions, Except as to Oil Burning Systems.

Steamer	Daisy Gadsby	Daisy Putnam
Owners	S. S. Freeman & Co.	S. S. Freeman & Co.
Tonnage	818 gross	886 gross
Length	191 feet	196 feet
Beam	41 feet	41 feet
Depth	14 feet	14 ft. 6 in.
Boilers	2 B. & W. Marine	2 B. & W. Marine
Total heating surface	2460 square feet	2460 square feet
Engine, size of.....	13½—22—36x24	13½—22—36x24
Type of engine	Triple Expansion	Triple Expansion
I. H. P. main engine.	640	648
I. H. P. auxiliaries..	32	32
Total I. H. P.....	672	680
Voyages	12/1/13 to 1/17/14	12/6/13 to 1/17-14
Total knots (est.)...	2021	2021
Total hours at sea.	448	450
Total hours in port.	691	531
Average r.p.m.....	125.6	127.1
Total oil at sea.....	1195 bbls.	1081 bbls.
Total oil in port.....	231 bbls.	163 bbls.
Oil per 24 hr. at sea.	64 bbls.	57.6
Oil per 24 hr. in port.	8.01 bbls.	7.37 bbls
Oil per I. H. P. at sea	1.3[illegible] lbs.	1.18 lbs.
Make up feed water for burners	32 bbls. per 24 hrs.	None
Oil burning system..	Steam Atomizing	"Coen" Mechanical

In the White patent fuel oil system, the use of fire bricks has been eliminated. The air supply is delivered by means of a patented air heating front, fitted with radial vanes which conduct the heat from the furnace to the incoming air, and convey the air to the center and around the burner. There is a further arrangement of air-regulating cones which control the supply when running, and entirely close the air admission when not burning oil. A sliding cone regulates the length and spread of the flame. This system of regulating cones permits complete control of the air admitted to the furnace, thus insuring perfect mixtures of air and oil. No air can pass through the furnace without coming into contact with the flame, and complete combustion is obtained when the cones are correctly set.

(To be continued.)

Condensation of gasoline from natural gas is subject of Bulletin 88, Bureau of Mines. By this means the most desired constituent of crude oil is obtained, the production of oil is not hindered, and the gas, after the extraction of gasoline, can be returned to the leased area to drive pumps or into pipe lines for uses to which natural gas is ordinarily put, generally with its fuel value lessened only in a slight degree.

APPLICATION OF ELECTRICITY TO GRADE CROSSING DEVICES.

BY J. A. BELL.

(After an explanation of the need for grade crossings a simple description is given of the various methods of warning employes. The paper was presented before the Los Angeles Section of the American Institute of Electrical Engineers, April 20, 1915.—The Editor.)

While the specific subject of this paper is the application of electricity to protective devices at grade crossings, it is not out of place to include a brief summary of the conditions that have brought about the highway crossing problem. Of course the obvious answer to the grade crossing question is a separation of grades, and it is rather surprising how readily most people assume that it is only a question of a short time before the problem will be universally solved in this way.

When railroads were built in thickly settled portions, a separation of grades could with reasonable engineering skill be usually effected when a road was first built, and the returns from the estimated traffic in such regions warranted the additional outlay. But because of the character of most of American railroad development and as the railroads had to be built with the least possible initial expenditure, a separation of grade at the beginning was out of the question.

With the development of the regions into which the railroads were built, the laying out of great railroad yards, the construction of innumerable sidings to industrial plants, the laying out of streets and roads adjoining the railroad's right of way, the prodigious increase in land values immediately contiguous to the railroad right of way, the difficulty of grade separation has become enormously intensified and to do it on a comprehensive scale has now become practically impossible. At the same time the intensity of the problem has in the last few years been increased many fold and out of all proportion to the rate of increase of population. This is due to the advent of automobiles. A little less than a dozen years ago, the grade crossing was a serious problem only in the immediate vicinity of towns and cities and was, if I may so term it, confined to limits that were a function of the horse drawn vehicle. This condition, as you all know, has undergone an extraordinary change under our very eyes. On any of the great highways throughout Los Angeles County at points 30 or 40 miles distant from the city, there is, particularly on Sundays, a vehicular movement quite comparable to the traffic of a fairly busy city street. These highways cross both steam and electric tracks at grade, not once, but scores of times and the number of such crossings is continually on the increase, due to the opening up of new tracts of land for settlement and subdivision.

The conditions prevailing in this territory are only typical of what is taking place in a greater or smaller degree over the entire country and the question of adequate protection to the public has become one of the most perplexing problems of the railroad manager.

In general it may be broadly stated that the courts hold the railroads responsible for the safety of the public at these crossings. On the other hand, the rule is the not unreasonable one that the railroads are generally exonerated from blame if they have employed the best practical means at their disposal of protecting the public. Everything hinges on the definition given to the word practical. We have seen that anything like a comprehensive separation of grades is not practical. The employment of men at every crossing as flagmen at a cost ranging from $30 per month to $90 or $100 per month is prohibitive. The use of automatic means of warning is not entirely practical and so there still remains the question of what is the best practical method. It is here that the railroad manager finds a most valuable assistant in electric current, as by its aid and at a relatively trifling expense he is enabled to install devices that are far more effective in warning the public of danger than any human guardian of the crossing could possibly be.

Warning Device Essentials.

Before taking up the application of electricity to these devices, it is worth while briefly considering what is essential in a warning device intended for the general public. It will be seen at once that any system of signals, such as govern the movement of trains, is altogether inadequate and impractical as applied to the general public. Trainmen are persons who are carefully selected for their age, intelligence, health, hearing, vision and other faculties. Before being entrusted with the care of a train they are carefully instructed in the meaning of all signals governing train operations and no man who fails to pass a most rigid examination in this respect is placed in a responsible position so far as the train is concerned. A red light or a green one has a certain definite specific meaning which every trainman must know. The position of a semaphore arm means a certain thing in relation to the operation of a train, which every man must thoroughly understand although such meaning is purely, if I may so call it, empirical. In fact most signals in connection with the operations of trains are arbitrary signs and would be just as good and just as effectual if the meanings were reversed, so long as the trainmen understood their purpose. For instance, it is customary to use a red light to indicate danger, and a green light to indicate safety. If a great railroad company should decide that a red light should be a signal for clear track and a green light the signal for danger, the system would probably work equally as well, once the trainmen had been schooled to the meaning of the signals. But when you are dealing with the public, you are confronted with an entirely different problem. The railroad cannot pick its public as it picks its employes.

While it is undoubtedly true that the general public can be educated as to the meaning of certain signals, it none the less takes time to do it and there is always a fresh supply of young, inexperienced persons or people who have lived in districts remote from railroads and who suddenly find themselves where railroads abound, who have to be considered.

An arbitrary signal that has no especial characteristic is of little use in dealing with the public. For instance, a railroad might install a system whereby a certain position of the semaphore would mean that the highway was safe, while in another position it

might mean that a train was approaching. In fact, just such a signal as this has been used. But to begin with, consider the possibility of mistake as to the meaning of any particular position of such a signal. It is probably safe to say that not less than 10 per cent of the traveling public would be unable to state correctly which was the safe position of the signal and which the danger position. Again the railroad must take into consideration people with defective faculties and a signal which is merely visual in character is of little service to a person whose eyesight is seriously impaired, and on the other hand, a signal which is audible only is of no use to a deaf man. A common example of the arbitrary type of signal is the common crossing sign with the legend on it of "Railroad Crossing, Danger, Stop, Look and Listen," or something similar. The shortcomings of this device are too obvious to dwell upon. It is quite easily overlooked at a crossing where there is a considerable number of telegraph, telephone or electric light poles or where there is no sky line against which it may be projected or where there is a large number of heavy loads passing to obscure the view.

Unless it is illuminated at night it is useless. This sign is typical of all stationary signs in its defects and it is in remedying the shortcomings of such signs as these that electricity plays so useful a part. The audible signal was a great advance over the stationary signal and there are a wide variety of such signals used by the railroads which are more or less effective in character.

The electric bell is manifestly inadequate in the case of the deaf, as location by means of sound is not an accurate mental process. Furthermore, a signal solely dependent upon sound for its warning may be easily overpowered or confused with similar sounds. For instance, a man and his family was recently killed at a steam road crossing protected by an electric bell. It transpired that the electric bell was actually sounding its warning, but at the same time the bell of the locomotive which caused the accident was clanging, the gong of a passing electric car was also ringing and the bells on an adjoining church happened to be ringing at the moment the man undertook to pass the crossing. It is little wonder that he was confused by the multiplicity of sounds and was unable to accurately locate the approaching danger.

Consequently it is advisable to make use of all the faculties that warn people of danger. These two faculties are sight and hearing. The warning should be of so striking and arresting a nature as to attract the attention of everybody.

Practically all combination visual and audible devices employ for the audible element a bell or gong actuated by electrical energy, while for the visual element a great deal of ingenuity has been expended in providing something that moves to arrest the eye. Waving semaphore blades, waving disks, flash lights, lights of different colors illuminated one after another to give the impression of an illuminated arm waving to and fro are the commonest forms that the visual element takes in these devices, and all of them are actuated by electrical energy.

Automatic Warning Systems.

Two general classes of control are used to actuate a warning device at crossings, the open circuit system and the closed circuit system. We will take up the latter first because of its simplicity, its certainty and the fact that it would be undoubtedly used in all cases if the conditions under which the railroad is operated would permit. Take a stretch of single track steam road with highway crossing at grade as a typical instance. The method employed in the electrical control of a signal through a closed circuit is substantially as follows: At the crossing, insulated joints are placed in the track and at points at which the signal should commence to function, other insulated joints are inserted in the track. These mark the limits of the protected zone. At each limit the rails are connected to two or more cells of gravity battery and at the crossing itself, the rails on both sides of the insulated joints are connected to an interlocking relay. Thus the rails between the insulated joints, the cells with their connections to the rails and the relay with its connection form the closed circuit.

The operation of this system is simplicity itself. When a train enters the protected zone the first pair of wheels to pass the insulated joints shorts the circuit. The relay functions by the action of gravity when the current from the gravity cells is cut off and makes a connection to the battery, lighting circuit or whatever other source of power is employed by the railroad in the operation of its signals. The interlocking relays are of such a character that the train upon passing the crossing cuts off the operation of the signal without the relay itself going to normal and it is not until the train has passed out of the protected zone on the other side of the crossing that the relay goes to normal and the system is again ready for the approach of a train moving in either direction.

Apart from its simplicity, this method of control has the merit of conforming in large measure to a highly desirable quality in all danger signals. The general principle underlying these is to maintain the signal normally in a condition of unstable equilibrium. When the agency by which this condition is maintained is injured or destroyed, in other words when the apparatus gets out of order, the signal, through the action of gravity, automatically goes to danger. Now it is manifestly an absurdity to expect a machine made up of a number of working parts, such as are most of the present day crossing signals, to put itself into operation when any of these parts are broken.

But the chances of a well made machine getting out of order are rather remote as compared with the possibility of derangement in a track circuit. Cells may fail, bond wires may break, insulated joints may become defective. When this occurs, when the closed circuit is opened by any agency whatsoever, the relay functions and the signal goes to danger. This is one of the most valuable features of the closed circuit system and one that will in the course of time, as the electric railroads acquire the necessary means or the system as applicable to electric roads becomes less costly than it is at present, lead to its universal adoption.

(To be continued.)

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The Electric Pump and the Storage Reservoir

The use of electric power in pumping water for irrigation has now been generally adopted throughout the West in those localities where electric service is on a fair basis of comparison with its competitors.

The paper by H. Day Hanford, appearing elsewhere in this issue on this important subject adds much to our knowledge in setting forth unit costs and many other fine points to be considered in effecting efficient installation and operation.

As stated by the author, the centrifugal pump seems to be especially adaptable as a unit for raising the water. It is surprising to see to what proportions this giant of recent creation has grown. Scarcely ten years have passed since the electrically operated centrifugal pump made its incipient bow among the arid districts of the West. Today, the greatest installation of this nature in the world, may be witnessed at the Sutter Basin project which is situated in the Sacramento valley of California near the confluence of the Sacramento and Feather rivers. The plant has a total capacity of 676,000,000 gallons of water per day and requires 5000 h.p. for its operation. Its six 50 in. diameter pumps, operating against a maximum head of 29 ft. at a speed of 248 r.p.m., are direct connected by means of flexible leather link couplings to constant speed motors.

In small units, distributed over large and fertile areas, the modern central station has found a profitable and ever increasing field of endeavor. Indeed so great has become this load that many of the great hydroelectric companies of the West now find that their annual valley of connected load is situated in their winter chart instead of the summer as formerly.

A feature in pumping plant installation has developed, however, that demands the careful attention of the agriculturist and power expert alike. Many fertile valleys of the West are not sufficiently arid to demand irrigation every year. The agriculturist has, nevertheless, found it to his interest to install electrically operated pumps as an insurance against possible lean years in rainfall. Thus in the great Tokay grape districts in and around Lodi, California, this is true.

Many of these did not turn a wheel during last year as rainfall was experienced in sufficient quantities. During the year before, however, more than one grape producer paid for his complete installation, because by it he saved his crop from complete failure and converted it into a paying business.

The experience of last year above alluded to has, however, caused many thoughtful men to consider the installation of small reservoirs so that the plant equipment may be reduced to half its installed capacity and yet by running night and day—the night run dumping itself into the reservoir—the same quantity of water may be available for irrigation during the day time, and yet a cheaper rate of electricity thereby becomes available.

While this procedure at first sight would seem to militate against the power company in reducing its connected load, still it is unquestionably of economic advantage to the former and even from the central station standpoint a more even and widely distributed load factor is at once made available.

The subject is one that is deservedly receiving much attention at present in the great interior valleys of California and well merits the attention of both agriculturist and power expert.

The True Value of an Exposition

Many great institutions have been conceived to dazzle the human mind and thus enable the designer or power behind the conception to dominate human effort and subjugate other less brilliant achievements, through sheer audacity. Catherine the Great, of Russia, with her huge palace of ice shedding forth myriads of rainbow dreams for a day, undoubtedly attempted this method of domination. On the other hand, institutions and displays have been conceived to so imbue the beholder with fear that a resulting domination has been accomplished in a strangle-throat grip that few can withstand. The parading of huge armies of men, the display of national armaments and indeed the very publishing of carefully worded reports from the battle front are daily instances of this method of domination that all may now behold throughout the world today.

Fortunate, indeed, is it that some Roman philosopher hundreds of years ago gave to the world the old proverb, "The force of truth is everlasting and it shall prevail." And so it is that the true value of a great international exposition is that it enables the investigator to find out the truth about matters of world concern.

To be sure a Tower of Jewels may in a measure dazzle the imagination, a statue of a bowman with quivering arrow may spur this imagination to further flights, or even a Joy Zone entice the weary investigator from pursuits of quiet research, but the fact remains that the force of truth to be found in the quiet and sequestered haunts of the exhibitor is everlasting and it shall prevail.

As one passes through aisle after aisle of exhibits of human progress in invention and manufacture displayed at the great San Francisco exposition, this truism grows more and more upon him. Here he sees before his very eyes in a clear and convincing manner the accomplishment of human endeavor that a library of books and magazines could not unfold to him. How small and mean now become the blow and the bluff of the imposter and on the other hand how overpowering and impressive now becomes the arguments of the design possessing true merit. Here in this array we may say with Kipling that "the shouting and the tumult dies, but still stands thine ancient sacrifice." This time, however, the sacrifice is not in the nature of a broken and a contrite heart as mentioned in Kipling's great poem, but rather the sacrifice that the human race offers to genius and intelligence in bestowing a just reward to merit and true accomplishment.

Fifty million dollars seems an enormous outlay for an exposition. No one can figure such a return in dollars and cents to be possible to the communities that have subscribed these vast sums of money. It is equally true that no one has ever been able to figure on a dollar and cent basis the return of human effort put forth into any truly laudable undertaking. Yet is is true beyond the question of a doubt that the effort put forth by the exhibitors at this exposition and by the communities that have financed this great undertaking will bear fruit one hundred fold.

It will indeed be impossible to trace its commercial influence throughout the world. The names of San Francisco and the great Panama-Pacific International Exposition have become bywords—not alone in this country and Canada, but also in far off Japan, in the interior of China, among the ever-growing South American Republics and indeed in every quarter where industrial growth and human progress are to be courted.

The exhibits that are so painstakingly displayed are daily impressing themselves upon witnesses that will carry their testimony to every corner of the earth. They sink upon a receptive imagination and, like the ripples of the ocean, their influence eventually girdless the earth.

The Passing of the Flat Rate

Although the flat rate system of charging for electric service is practically a thing of the past in California, it is still in vogue in some more isolated Western communities. During the past few months the Railroad Commission of Oregon has been investigating such a situation in eastern Oregon. Almost on the eve of announcing its findings, it finds itself somewhat embarrassed by a decision of the Circuit Court, which construes the Eastern Oregon Light & Power Company's franchise as prohibiting meter rates except where the town or customer consents to their substitution for flat rates. If the commission, for example, should fix meter rates, the utility would be in the position either of violating the court decree or of disobeying the order of the legislature expressed through the order of the commission.

"Such a conflict of authority cannot be tolerated. One or the other must yield." Thus argues Clyde B. Aitchison, counsel for the commission, in an appeal which has been taken to the State Supreme Court. He contends that inasmuch as the state has full police power to regulate rates, especially in the case of a franchise contract "born with a congenital infirmity" such as the one in question, the court decree should be binding only until such time as the matter shall be passed upon by the commission.

There can be but little question as to the justice of the argument, which is in no way intended to anticipate the commission's decision. Concerning the latter, however, there can be but little more question. Flat rates are now widely recognized as being unscientific, as having no relation to the cost or value of service, and as causing waste of power. Like the exploded theory of regulation by competition they have no place in a community whose public utilities are regulated by a public service commission.

PERSONALS

E. N. Fobes, of the Fobes Supply Company, Portland and Seattle, is in Southern California.

W. M. Carpenter, vice-president of the American Cross Arm Company of Chicago, is at San Francisco.

Samuel Kahn, manager of the Western States Gas & Electric Company of Stockton, is at San Francisco.

E. C. Brearty of the American Electric Heater Company, Detroit, Mich., is a visitor at San Francisco.

A. J. McConnell, associated with the Seward Peninsula Power Company, Nome, Alaska, is at San Francisco.

H. B. Squires of the H. B. Squires Co., San Francisco, returned the first of the week after a trip to Southern California.

F. P. Wilson, assistant superintendent of production, General Electric Company, Schenectady, N. Y., is at San Francisco.

Hal Lauritzen, representing the Holophane line with the Pacific States Electric Company, San Francisco, is at Los Angeles.

F. H. Leggett, Pacific Coast manager Western Electric Company, has returned to San Francisco from a trip to Southern California.

F. S. Hunting, general manager of the Fort Wayne Electric Works, of General Electric Company, Fort Wayne, Ind., is at San Francisco.

Carl Hering, consulting electrical engineer of Philadelphia, is at San Francisco in connection with the work of the International Jury of Awards.

S. B. Gregory, representative of the Arrow Electric Company, San Francisco, returned the latter part of the week after a business trip to Los Angeles.

C. J. Winslow, Electric Appliance Company representative in charge of San Joaquin Valley territory, California, was a visitor at San Francisco during the week.

Harry H. Geohard of the C. A. Wood Preserver Company, is at San Francisco from Portland, where he appointed W. W. Cordon as a representative of the company.

H. H. Noyes, representative of the Electric Appliance Company, in charge of northern California and Oregon territory, spent a few days at San Francisco during the week.

C. P. Poole, consulting engineer of Atlanta, Ga., arrived at the Panama-Pacific International Exposition during the past week to take up his duties as a member of the International Jury of Awards.

Captain Edward Seymour Walton, quartermaster United States Army, Arizona, is at Fort Mason, San Francisco, Cal., in connection with the preparation of plans and specifications for a power plant in Arizona.

F. R. Brown, formerly sales manager with the Best Manufacturing Company, Niles, Cal., has accepted a position with the Barusch Electric Controller Company as sales representative of the latter company in charge of Southern California territory.

Edwin B. Pike, formerly manager of the Tungstolier Works of the Canadian General Electric Company, Toronto, Canada, has become associated with the Jefferson Lamp Company as Pacific Coast representative, with headquarters at San Francisco.

MEETING NOTICES.

Electrical Supply Jobbers, June 24-25-26, 1915.

Much interest centers in the coming meeting of the Electrical Supply Jobbers' Convention which is called for June 24-25-26. The convention is to be held in Yosemite National Park and the committee of arrangements consisting of Messrs. Berry, Taylor and Holabird are already getting matters so shaped as to insure a delightful as well as a profitable meeting.

Oregon Society Engineers.

On May 5th, thirty members and their wives took advantage of the Celilo celebration at Big Eddy near the Dalles, Oregon. This celebration was in connection with the opening of the $5,000,000 government locks at that point in the Columbia River. The Oregon Society of Engineers had a private car, leaving the union depot at 7:30 a. m. and returning at 12:00 midnight. The various engineering features were inspected during the time spent at Big Eddy.

California Association of Electrical Inspectors.

Regular business meeting of California Association of Electrical Inspectors was held May 8th, in the General Electric Company's exhibit in the Manufacturer's Building, P. P. I. E. The meeting was called to order at 3:10 p. m., by Vice-President Brothers. A panelboard in which was incorporated a safety to life feature was submitted for comment by the Drendell Electrical & Manufacturing Company. The members were then taken in charge by Messrs. Davis and Hixson of the General Electric Company, who in a most enlightening manner showed the many interesting features of the various devices in this exhibit. Present: Carrell, Hodgkins, Ellison, Spencer, Dixon Brothers, Jones, Cleary.

Portland Jovian League.

At the weekly meeting on May 7, sixty-one members enjoyed the entertainment provided by the Northwestern Electric Company, W. H. P. Hill being chairman of the day. A report for increasing the efficiency of the meeting was received from Henry Schade of the efficiency committee. H. V. Carter, president of the Pacific States Electric Company, spoke about the electrical contractor as a business getter for the central station and jobber. Handsome gate prizes were drawn by C. E. S. Wood, Mr. Weinstock and W. G. Stearns. C. E. S. Wood spoke interestingly on the subject, "Don't Be Afraid of the Things That are New." He emphasized the fact that specialists are inclined to be narrow, that little progress has been made in the past 3000 years aside from the compilation of data. Progress, of necessity, must be new.

Electrical Development and Jovian League.

The May 5th meeting of the league was one of the most enthusiastic and best attended meetings of the year, 106 being present. On account of the absence of President Leggett from the city, Vice-President Butte presided. After committee reports were heard the drawing for the five prize lunches was called, the winners being Messrs. Behan, Beck, Bibbins, Brown of Western Electric Company, and Brown of Roeblings. There being no further business, the meeting was turned over to Mr. W. S. Hanbridge, secretary of the California State Contractors' Association, as chairman of the day, who provided a generous supply of vocal and instrumental music and introduced as the speaker of the day Dr. David Starr Jordan. Dr. Jordan took as his subject "The Efforts of the Peace Congress at The Hague," of which Dr. Jordan was a member. After telling of the work of the congress and some of the causes leading up to the present European war, the meeting adjourned at 1:45 P. M., with a vote of thanks to the speaker and chairman of the day.

The Jovian Electrical League of Southern California.

The luncheon of the League held at the New Christopher's gorgeously appointed and beautifully illuminated ban-

quet room, on May 4th, will long be remembered by those who were wise enough to attend the inauguration, as the most enjoyable of the many joyous midday feasts arranged by the League. It was announced as Ladies' or Avrenim Day and the privilege of initiating the fair sex into the mysteries of Los Angeles Jovian festivities, was taken advantage of by almost every one present, swelling the grand total to about 300, of which number nearly one-half were women, who entered most loyally and to their apparent amusement into the Jovian frolics, so ably perpetrated on the assemblage by their very able and jovial Tribune, J. Harry Pieper. While one of the members was fined for not bringing his wife and another for not having one to bring, another was rewarded with cash for having the courage to bring his mother-in-law. These interesting facts were brought out during the introduction of guests, which also disclosed the names of a considerable number of men prominent in civic affairs. Among these was Councilman Conwell, who was fined for not heading the list of councilmanic candidates at the primary election held the day previous. Ralph Clapp, by request, very ably interpreted the meaning of the word "Avrenim" to those not acquainted with the eccentricities of Jovianism. Tribune Pieper, in a few well chosen words, welcomed the guests to this inauguration of the new quarters and predicted that this happy event would probably result in a series of ladies' luncheons during the year. He also announced the selection of big Henry Holland as chief of the degree team for the rejuvenation to be held on May 20th. Max Loewenthal, in behalf of Jimmie Rogan, Photographer Bishop of the Edison Company and himself, presented a large portrait of Harry Pieper to his wife and a number of Jovian pennants to the league, to be used to decorate the walls of the league's club rooms, when this dream becomes a reality. Chairman of the Day, Milton Vernon Simpson, then took charge of affairs, which he had successfully planned and introduced the long expected Jovian Glee Club, whose members acquitted themselves most creditably under the able direction of Professor Joseph Dupuy. Through the courtesy of Mr. Simpson and the firms he represents, each lady was presented with a handsome cut glass and silver flower holder, which was greatly appreciated. There was more good singing by Miss Lillian K. Merriam, accompanied by Dick Alter and then Rev. Dr. Joseph S. Glass delivered a stirring address on "Men Wanted." He referred to the peculiar fitness of his subject with relation to this luncheon, but seriously reminded his hearers of the need of men who exercise their rights of suffrage intelligently and the need of men with cool heads in Europe during this crisis. We need men in business who value the execution of the golden rule more than the acquisition of great wealth. We need men in the educational field, men who are fearless and upright in the press, the schools, the libraries and the churches. Men, who do not seek personal advantage at every step, who will lift up their fellow men and practice idealism, who are willing and anxious to make a sacrifice for the things that are worth while. He reminded the women that the ideals of manhood are in their keeping and that this is indeed a sacred trust. At the conclusion of the address, James F. Rogan, in behalf of himself and the Edison Storage Battery Company, presented to the league, a beautiful silver loving cup, about 27½ inches high, suitably engraved, the same to be a perpetual trophy to be awarded each year to the chairman who planned and executed the best luncheon program, the choice to be made by a committee of three, appointed by the chairman, each member of this jury to render his verdict individually, as he is not aware of the identity of his fellow members. Tribune Pieper thanked Mr. Rogan for the handsome gift and this brought this highly enjoyable luncheon to a close.

N. W. Electric Light & Power Association.

The annual convention of the Northwest Electric Light & Power Association is to be held at Portland, September 15th to 18th. The order of papers may be changed to some extent, but will be substantially as follows:

1. "Serving Small Consumers," by Hugo Eisenmenger of the National Lamp Works, Cleveland, Ohio.
2. "Study of Apportionment of Charges for the Purpose of Determining Cost of Service," by J. A. Rockwood, Portland Railway, Light & Power Company.
3. Overhead Line Committee Report, J. C. Martin, Pacific Power & Light Company.
4. "Development of Small Motor and Appliance Load," L. M. Simpson, Enterprise Electric Company.
5. "Determination of Maximum Demand," C. S. MacCalla, Washington Water Power Company.
6. "Steam Plant Operation and Costs," E. D. Searing, Portland Railway, Light & Power Company.
7. "Practical Application of Modern Illumination," by Messrs. F. H. Murphy and G. H. Kumler.
8. "Wrinkles," P. A. Bertrand, Gray's Harbor Railway & Light Company.
9. Public Policy Committee Report, N. W. Brockett, Puget Sound Traction, Light & Power Company.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

The Midway Gas Company has filed an application with the Commission, requesting authority to acquire the properties of the Southern California Gas Company and the Northern Exploration Company. The Midway Gas Company is the owner of a pipe line approximately 111 miles in length extending from Kern County to the city of Los Angeles. This line is now leased by the Southern California Gas Company. The application states that the actual cost of the properties of the Southern California Gas Company to November 30, 1914, with interest at six per cent per annum to April 1, 1915, was $573,243.99, and that the actual cost of the properties of the Northern Exploration Company for a similar period was $323,764.75. The merger of these properties is in line with a re-organization plan dated March 1, 1915. The Midway Gas Company's application asks the commission to authorize the issue of certain securities as follows: $2,125,000 for first and refunding six per cent gold bonds; $88,305 of five year six per cent gold notes; $405,000 of seven per cent cumulative non-assessable preferred stock.

The Southern California Gas Company has filed an application with the commission, requesting authority to renew promissory notes in the sum of $15,024.77.

Charles F. Snyder, proprietor of a telegraph line between Angels Camp and San Andreas, Calaveras County, has filed an application with the commission, requesting authority to discontinue the line.

The commission has issued an order authorizing the Oakland, Antioch & Eastern Railway to refund certain promissory notes aggregating $200,400. The company is also given authority to pledge $36,000 of its first mortgage five per cent bonds as collateral security for a note held by the Union Switch and Signal Company, amounting to $21,028,77.

The commission has issued an order authorizing the San Joaquin Light & Power Corporation to issue $1,582,000 of Series "C" six per cent forty year first and refunding mortgage gold bonds. The company is also authorized to issue interest coupons calling for one per cent additional interest per annum to any holders of the $2,924,000 of Series "B" bonds now outstanding, who will pay a premium of $100 upon each $1000 bond held by them. Of the new Series "C" bonds which the company is authorized to issue $1,532,000 are to be issued in lieu of a like amount of Series "B" bonds now held in the company's treasury or pledged as collateral. The

commission's order provides that the Series "C" bonds shall be sold at such a price that the first $300,000 of bonds shall yield not less than 94 and accrued interest, and the remainder not less than 95 and accrued interest.

The San Francisco-Oakland Terminal Railways has filed an application with the commission, requesting authority to renew a promissory note in the sum of $27,000, held by the Central National Bank of Oakland, and bearing interest at six per cent per annum. This note was originally executed by the Oakland Traction Company.

The Fresno Interurban Railway Company has filed an application with the commission requesting authority to issue 250 shares of capital stock at $80 per share and $70,000 of bonds at ninety per cent of their face value.

The commission has issued an order authorizing the Southwestern Home Telephone Company, of Redlands, to issue promissory notes in the sum of $14,500, and to pledge as collateral security $29,000 of bonds.

The commission has issued an order authorizing P. J. Dubbell, trustee, to transfer the properties of the San Bernardino Valley Gas Company, comprising two gas plants in Redlands and one gas plant each in San Bernardino, Corona and Colton, to the Citrus Belt Gas Company. The order also provides that the Citrus Belt Gas Company may assume the mortgaged indebtedness of the subsidiary companies comprising the San Bernardino Valley Gas Company in the sum of $350,200 and issue 2000 shares of stock of the par value of $100 per share.

The Citrus Belt Gas Company is also authorized to execute a supplemental indenture for the purpose of extending the lien of the bonds of the Home Gas & Electric Company of Redlands of a total amount not to exceed $200,000 to cover all the properties to be acquired by the Citrus Belt Gas Company, subject, however, to outstanding bonded indebtedness.

The Santa Paula Home Telephone Company has filed an application with the commission, requesting authority to effect a consolidation with the Pacific Telephone & Telegraph Company, both operating telephone systems in Santa Paula, and to purchase a portion of the Santa Paula Exchange plant of the Pacific Telephone & Telegraph Company for a consideration of $25,400 to be evidenced by the issuance of its two-year six per cent note.

The commission has issued an order authorizing the Southern California Gas Company to issue two promissory notes, totalling $15,024.77, for the purpose of refunding similar notes now outstanding.

NEWS OF OREGON RAILROAD COMMISSION.

The commission has authorized the Western Telephone Company to increase its rates at Hubbard, Ore., to approximately double its former schedule, upon condition that it give a 24-hour service instead of a 14-hour service.

With regard to the application of the Oregon Power Company for an interpretation of Section 63, Public Utilities Act, 1911, ch. 279, the commission has made the following decision: "An electric utility which has filed tariffs showing its rates in several distinct localities, upon a block-rate plan whereby a lower rate is secured by increased quantity consumed, may not lawfully contract with a single user who desires to be served in different localities, that the aggregate amount of his consumption shall be taken and a single bill be rendered thereon, in order that the total charge made may be less than if the consumption from each user served by a single distributing system were separately computed at the tariff rate applicable in that locality. Such practice would immediately result in an undue preference to the consumer and an unjust discrimination against other patrons receiving a like and contemporaneous service under substantially similar circumstances."

NEWS OF ARIZONA CORPORATION COMMISSION.

The commission has denied the petition of certain residents of Phoenix that the lines of the Phoenix Railway Company make certain unprofitable extensions.

The commission has allowed Minor & Grosty of Winkelman, Ariz., to purchase the Winkelman exchange of the Mountain States Telephone & Telegraph Company.

The Nogales Electric Light, Ice & Water Company has been authorized to replace flat rates for electric power and lighting by a new schedule of meter rates.

TRADE NOTES.

The Morrison Electric Company is doing $1200 of work in the Pittock Block, Portland, Oregon.

Pierce-Tomilson Electric Company is installing $300 of electrical work at 41-43 Fourth street, Portland, Oregon.

Tuerick-Mackenzie Machine Works is installing $350 worth of electric motors for the D. P. Thompson Estate, 12 Second street, Portland, Oregon.

M. J. Walsh & Company are making the electrical installation in the new church of the Latter Day Saints, 222 E Twenty-fifth street, Portland, Oregon.

The library board at Great Falls, Mont., has awarded the contract for rewiring the library building and for new lighting fixtures to the Great Falls Electric Supply Company for $1200.

Bids will be received by R. W. Davis, mayor of Harrisburg, Oregon, until May 28th for one 35 h.p. motor, 900 to 1200 r.p.m.; one 25 h.p., 900 to 1200 r.p.m.; one 5 h.p., about 1500 r.p.m.

Busch-Sulzer Bros. Diesel Engine Company's exhibit at the Panama-Pacific International Exposition was the scene of much festivity during the week in recognition of Missouri Day at the Fair, the home of the firm being at St. Louis, Mo. Decorations, lectures and hearty greetings were features of the day at the exhibit.

A. Garfield Drake, formerly with the Woodill & Hulse Electric Company, Jean G. Drake, auditor of the Long Beach Bath House & Amusement Company, and Ralph B. Clapp, formerly of the Westinghouse Electric Company, have organized the Drake-Clapp Electric Company, as a modern electrical store at 217 West Fourth street, Los Angeles.

Westinghouse agent jobbers held a get-together meeting Tuesday evening at San Francisco. Speech, song, and story were indulged in and a discussion of modern business getting methods created a lively interest on the part of those present. Some 30 representatives, including members of the staff of the Electric Railway & Manufacturers Supply Company, San Francisco, attended the meeting.

The city of Seattle lighting department has awarded a contract to the General Electric Company, through their Seattle office, consisting of 11 57½ k.v.a automatic single phase feeder regulators, and 6 64-kw. constant current series lighting transformers. This equipment has been purchased with an idea of replacing some less efficient equipment and to provide for extensions already under way.

The Union Metal Company has placed on the market a one-light electrolier made entirely of high grade steel and equipped to carry a 16x8 ball globe. It is designed on correct architectural lines, being Greek Doric, with classic fluted column made with entasis and stopped flutes. This standard is intended particularly for the lighting of residence districts, and ts constructive features are decidedly novel and most interesting both from a layman and engineering standpoint. The Pacific States Electric Company of San Francisco, Los Angeles, Portland, Seattle and Oakland, are distributers for this material on the Pacific Coast.

P. P. I. E. CONVENTIONS.

James H. Barr, director of congresses to be held during the Panama-Pacific International Exposition, has just issued an announcement of those scheduled to date, 822 in number. From this announcement the following list of engineering and allied conventions has been selected:

California State Association of Stationary Engineers, San Francisco, May 27, 28 and 29, 1915. W. T. W. Curl, Secretary, 4103 Dalton avenue, Los Angeles, Cal.

National Electric Light Association, San Francisco, June 8 to 11, inclusive, 1915. T. C. Martin, Secretary, 29 West 39th street, New York City.

Pacific Coast Machinery Dealers' Association, San Francisco, June 18 to 19, 1915. Eldridge Green, President, 39 Stevenson street, San Francisco; John W. Berger, Secretary, 110 Market street, San Francisco.

Pacific Claim Agents' Association, San Francisco, June 24, 25 and 26, 1915. T. N. Henry, Secretary, Electric Building, Seattle, Wash.

California State Association of Electrical Contractors and Dealers, San Francisco, July 19, 1915. W. S. Hanbridge, Secretary, Rialto Building, San Francisco.

American Academy of Political and Social Science, San Francisco, July 31, 1915. Prof. L. S. Rowe, President, University of Pennsylvania, Philadelphia, Pa.; Prof. J. P. Lichtenberger, Secretary, University of Pennsylvania, Philadelphia, Pa.

American Association for the Advancement of Science, San Francisco, University of California, Stanford University, August 2 to 7, inclusive, 1915. Dr. L. O. Howard, Permanent Secretary, Smithsonian Institute, Washington, D. C.; Albert L. Barrows, Associate Secretary, Pacific Division, University of California Library, Berkeley, Cal.

American Institute of Chemical Engineers, San Francisco, August 25 to 28, inclusive, 1915. Prof. J. C. Olsen, Secretary, Cooper Union, New York City.

American Chemical Society, adjourned meeting, San Francisco, September 4, 1915. Dr. Charles H. Hurty, President, Chapel Hill, N. C.; Chas. L. Parsons, Secretary, Box 500, Washington, D. C.

Institute of Radio Engineers, San Francisco, September 13 to 18, inclusive, 1915. David Sarnoff, Secretary, 71 Broadway, New York City.

International Irrigation Congress, Stockton, September 13 and 14, 1915; Fresno, September 15 and 16, 1915; Sacramento, September 17 and 18, 1915; San Francisco, September 20, 1915. J. B. Case, President, Abilene, Kansas; Arthur Hooker, Secretary. Fresno, Cal., during April and May; Sacramento, Cal., during June and July; Stockton, Cal., during August and September. L. A. Nares, Chairman, Board of Control, Fresno, Cal.

American Society of Mechanical Engineers, San Francisco, September 16 and 17, 1915. Calvin W. Rice, Secretary, 29 W 39th street, New York City.

American Institute of Mining Engineers, San Francisco, September 16 and 17, 1915. Bradley Stoughton, Secretary, 29 W. 39th street, New York City.

American Electrochemical Society, San Francisco, September 16, 17, and 18, 1915. Prof. Jos. W. Richards, Secretary, Lehigh University, South Bethlehem, Pa.

Panama-Pacific Convention of the American Institute of Electrical Engineers, San Francisco, September 16, 17, 18, 1915. F. L. Hutchinson, Secretary, 33 W. 39th street, New York City.

American Society of Heating and Ventilating Engineers, San Francisco, September 16, 17 and 18, 1915. J. J. Blackmore, Secretary, 29 W. 39th street, New York City.

American Society of Civil Engineers, San Francisco, September 16 to 19, inclusive, 1915. Chas. Warren Hunt, Secretary, 220, West 57th street, New York City.

Mining and Metallurgical Society of America, San Francisco, September 20, 1915. W. R. Ingalls, President, Tenth avenue and 36th street, New York City. F. F. Sharpless, Secretary, 52 Broadway, New York City.

American Mining Congress, San Francisco, September 20, 21, and 22, 1915. J. G. Cailbreath, Secretary, Washington, D. C.

International Engineering Congress, 1915, San Francisco, September 20 to 25, 1915. Prof. W. F. Durand, Chairman, Foxcroft Building, San Francisco; W. A. Cattell, Secretary, Foxcroft Building, San Francisco.

American Society of Agricultural Engineers, San Francisco, September 21 and 22, 1915. F. M. White, Secretary, Madison, Wis.

Telephone Pioneers of America, San Francisco, September 21, 22 and 23, 1915. Theodore N. Vail, President, 15 Dey street, New York City; I. H. Starrett, Secretary, 15 Dey street, New York City.

American Society of Refrigerating Engineers, San Francisco, September 23 and 24, 1915. W. H. Ross, Secretary, 154 Nassau street, New York City.

American Mine Safety Association, San Francisco, September 23 and 24, 1915. Dr. A. F. Knoefel, Terre Haute Building, Terre Haute, Ind.; H. M. Wilson, Secretary-Treasurer, Bureau of Mines, Pittsburgh, Pa.

American Association of Refrigeration, San Francisco, September 23 and 24, 1915. Frank A. Horne, President, 161 Chambers street, New York City; J. F. Nickerson, Secretary, 431 S. Dearborn street, Chicago, Ill.

Illinois Gas Association, (adjourned meeting), San Francisco, September 27, 1915. H. H. Clark, Secretary, 72 W. Adams street, Chicago, Ill.

Safety Conference, San Francisco, September 27 to 30, inclusive, 1915. Will J. French, Commissioner, California Industrial Accident Commission, San Francisco; John R. Brownell, President, Local Council No. 15, National Safety Council, Underwood Building, San Francisco.

International Gas Congress, San Francisco, September 27 to October 1, inclusive, 1915. Geo. G. Ramsdell, Secretary, 29 W 39th street, New York City.

American Gas Institute, San Francisco, September 27 to October 1, inclusive, 1915. Geo. G. Ramsdell, Secretary, 29 W 39th street, New York City.

Pacific Coast Gas Association, San Francisco, September 27 to October 2, inclusive, 1915. E. C. Jones, President, 702 Grant Building, Seventh and Market streets, San Francisco; Henry Bostwick, Secretary, 445 Sutter street, San Francisco.

American Electric Railway Accountants' Association, San Francisco, October 4 to 9, inclusive, 1915. M. R. Boylan, Secretary, care Public Service Railway Company, Newark New Jersey.

American Electric Railway Claims Association, San Francisco, October 4 to 9, inclusive, 1915. B. R. Davis, Secretary, care Columbus Railway, Power & Light Company, Columbus, Ohio.

American Electric Railway Transportation & Traffic Association, San Francisco, October 4 to 9, inclusive, 1915. E. B. Burritt, Secretary, 29 W. 39th street, New York City.

American Electric Railway Association, San Francisco, October 4 to 9, inclusive, 1915. E. B. Burritt, Secretary, 29 W. 39th street, New York City.

American Electric Railway Manufacturers' Association, San Francisco, October 4 to 9, inclusive, 1915. H. G. McConnaughy, Secretary, 165 Broadway, New York City.

American Electric Railway Engineering Association, San Francisco, October 4 to 9, inclusive, 1915. E. B. Burritt, Secretary, 29 W 39th street, New York City.

National Association of Railway Commissioners, San Francisco, October 12 to 16, inclusive, 1915; care Interstate Commerce Commission, Washington, D. C.

California Association of Electrical Inspectors, San Francisco, October 23, 1915. John W. Carrell, Secretary, 55 Fulton street, San Francisco.

Independent Telephone Association of America, San Francisco, October 25 to 29, inclusive, 1915. E. B. Fisher, President, Grand Rapids, Mich.; W. S. Vivian, Secretary, 19 La Salle street, Chicago, Ill.

NEW CATALOGUES.

Bulletin No. 43550 from Edison Lamp Works of General Electric Company attractively portrays means and methods of Sign Lighting with Edison Mazda Lamps.

"Switchboards for A. C. Power Stations" is a reprint of a series of articles by C. H. Sanderson and H. A. Travers from The Electric Journal, prepared by the Westinghouse Electric & Manufacturing Company for distribution. Switchboards of the self-contained, remote mechanically controlled and electrically operated classes are discussed in detail as to design, operation and costs.

NEWS NOTES

ILLUMINATION.

LINDSAY, CAL.—A new cable has been ordered for the electrolier system.

MOSCOW, IDAHO.—If plans of the university committee of the state board of education are approved, the buildings of the institution and campus will be electrically lighted by a power plant to be installed at the university.

FILLMORE, CAL.—H. R. Edwards has applied to the board of trustees for a franchise to operate a pipe line system along the streets of the city to carry oil or gas. The board will receive up to June 11th sealed bids for the franchise.

SAN FRANCISCO, CAL.—The Great Western Power Company has been given permission by the railroad commission to acquire the United Light & Power Company of San Francisco and Oakland, by means of a new company, to be known as the Consolidated Electric Company.

SEATTLE, WASH.—The county commissioners have granted an electric power and light franchise to G. A. Collins, who has organized a company that will build a plant to supply Vashen island and Maurey island with light and power. Work will be started immediately on a $20,000 plant.

SAN JOSE, CAL.—Upon the showing of W. R. Wilson that the majority of the property owners on North Second street, between Santa Clara and St. John streets, had signed contracts for the purchase and installation of electroliers, the council agreed that the city would light them.

FRESNO, CAL.—The supervisors have sold a 50-year gas franchise to the Parlier Winery Company, who will furnish manufactured gas to the towns of Parlier, Reedley and Kingsburg. The franchise was sold for $25 and 2 per cent of the gross earnings of the company will be paid to the county after five years have elapsed.

PORTLAND, ORE.—A permit has been issued to the city of Portland to appropriate 500 second feet of the water of Sandy River and Zig Zag Creek for the development of 20,000 horsepower. It is proposed, according to State Engineer Lewis to divert the water of the stream and generate power for electric lighting and municipal purposes. Under the request of Portland it was given until 1930 to complete the construction work under the proposed plans. The estimated cost is $2,000,000.

SACRAMENTO, CAL.—That 80 cents per 1000 cubic feet would be as low a rate for gas as the Pacific Gas & Electric Company would be willing to accept, was intimated by Manager George C. Holberton to the lighting rates committee of the supervisors. The ordinance rate for gas is 75 cents, but on the allegation that this rate is confiscatory, the United States Court has granted the company a temporary injunction, which permits it to collect 85 cents. The Master in Chancery has reported that the 75 cent rate does not yield the company 6 per cent.

TRANSMISSION.

SPOKANE, WASH.—The Little Spokane Light & Power Company has filed its application with the county commissioners of Spokane County asking for a franchise to erect a pole line for the transmission of electric current. May 21st has been set as the date of hearing.

WOODLAND, CAL.—The Yolo Water & Power Company has decided to make Woodland its headquarters, not only for engineering and office forces, but also for their main construction and assemblying point. Plans are now under way for the removal of the construction Camp at Madison, 12 miles west of this city, to a site on east Main street.

MONTESANO, WASH.—A power proposition to furnish electricity for the cities and towns of Chehalis county, Pacific county, Centralia, Chehalis and Olympia, is being promoted by Geo. E. Tilden of the Seattle Bond & Brokerage Company. The proposition will furnish unlimited power to Southwest Washington. The proposed power site is at Lake Cushman.

TRANSPORTATION.

SACRAMENTO, CAL.—One more train will be added to the run between this city and Stockton via the Central California Traction Company's line and two-hour service will be afforded under the new time schedule, which will go into effect May 24th.

SAN FRANCISCO, CAL.—The public utilities committee of the supervisors has directed that the Mayor and city attorney be requested to open negotiations with the United Railroads without further delay to the proposed use by the city of the United Railroads tracks on Church street and on Market street from Church to Van Ness avenue.

SAN FRANCISCO, CAL.—The railroad commission has directed the San Francisco-Oakland Terminal Railways to make arrangements for a more equitable rate than the 1⅛ cents per kw.-hr. now being paid to the United Light & Power Company. "This arrangement served to abstract the funds from the railway for the benefit of the power company."

SACRAMENTO, CAL.—At a conference between the city commission and General Manager John Britton of the Pacific Gas & Electric Company, it was agreed that the $10,000 due the city on forfeited franchises would be spent in resurfacing J street from Front to Twelfth street. Britton agreed that his company would lay new rails and pave the street between the car tracks at the same time. He said the work would start early this summer and be finished this fall.

TELEPHONE AND TELEGRAPH.

OGDEN, UTAH.—Improvements in the Ogden telephone system are under consideration of the Mountain States Telephone & Telegraph Company officials at Denver.

TUCSON, ARIZ.—The city council has adopted a resolution permitting the Mountain States Telephone Company to put wires under ground on certain streets in this city.

KINGSBURG, CAL.—Application has been made by the Pacific Telephone & Telegraph Company for a franchise in this city. Sealed bids will be received for the franchise up to June 28th.

ALAMEDA, CAL.—Telephone and electric service is to be afforded Bay Farm Island within a short time, the electricity commission and representatives of the Pacific Telephone & Telegraph Company agreeing to install a pole line, each bearing half the expense.

WILLOWS, CAL.—It is understood here that the new Sacramento Valley Telephone Company, which in February took an option on the Glenn County Telephone Company, and later optioned the Tehama County Telephone Company, having previously acquired the Colusa County Telephone Company, will in the near future take over the local company. The option held on the Glenn County Company, expired on May 10th, and, it is said, there has been no request for an extension of time. The Sacramento Valley Company was formed to take over the local business of the Pacific States Telephone & Telegraph Company in Colusa, Glenn and Tehama counties, as well as the independent companies of those counties.